

as follows:

(1) Short wave: The downward short wave radiation on a cloudy day is only slightly less than that on a clear day due to the multi-reflection effect between cloud and snow surface. On the other hand, there is no significant difference of snow albedo between clear and cloudy days. Therefore, the net radiation on a cloudy day does not largely decrease from that on a clear day. That is, SW cloud-radiative forcing is only weak cooling.

(2) Long wave: The downward long wave radiation on a cloudy day increases from that on a clear day, because of additional emission from the cloud. In addition, since the air temperature is very low and the water vapor contained in the atmosphere is very little on a clear day, the equivalent black body temperature of the downward radiation is very low so that the difference of downward radiation between clear and cloudy days is large. On the other hand, the difference of upward radiation between clear and cloudy days is not so large. Therefore the net longwave radiation on a cloudy day largely increases from that on a clear day. That is, LW cloud-radiative forcing is strong heating.

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ON SNOW CRYSTALS OF "DOUBLE GOHEI TWIN" TYPE (ABSTRACT)

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Observations of snow crystals of low temperature types were carried out at Alta (69°56'N, 23°16'E) and Kautokeino (69°01'N, 23°03'E), Finnmarksvidda, Norway from December 17, 1987 to January 31, 1988.

As a result, a peculiar shape of snow crystals of low temperature types was observed at both observation sites on January 1 and 10, 1988. The external shape of this crystal closely resembles that of the gohei twin types. However, the crystal grows from a center nucleus to both sides. Therefore, the crystal was named "Double Gohei Twin" types.

Considering the growth mechanism of snow crystals of this type, we were reminded of our laboratory experiments carried out about ten years ago. Based on the experiments, it is understood easily that if the airborne ice fragments come in contact with the surface of super-cooled cloud droplets, some of the droplets are frozen in a twin type manner. If one of the snow crystals was grown from the frozen droplets under the temperature conditions in which the column types are suitable to grow, the crystal might grow the double gohei twin type, rarely.

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